

Flight Activity of the Lesser Grain Borer Near Certified Seed Facilities

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Introduction

Rhyzopertha dominica (F.), lesser grain borer (LGB), is a serious pest of stored grain and grain processing facilities throughout temperate regions of the US. Foundation-certified seed stock facilities currently rely on application of chlorpyrifos-methyl directly to seed, applications of contact insecticides around the warehouse perimeter, and annual warehouse fumigation to manage this pest. The most common formulation of chlorpyrifos-methyl labeled for use on stored grain will no longer be available starting in 2005. To develop an IPM program for these facilities, LGB flight activity in and around a Kansas warehouse and the primary routes of insect immigration were studied. Results are broadly applicable to any grain storage or processing facility.

Materials and Methods



Lindgren Funnel Trap



Inside Warehouse

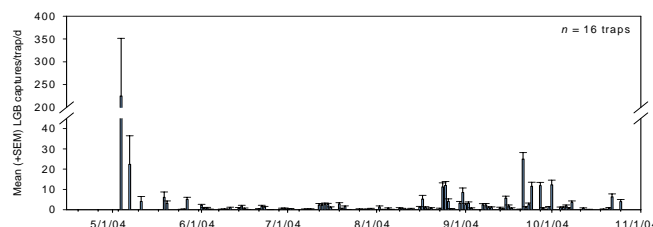


Unbaited Sticky Trap

- Phermone-baited Lindgren funnel traps were deployed outside of the grain storage warehouse in each of the four cardinal directions at distances of 0, 50, 100, and 150 m
- Three phermone-baited Lindgren funnel traps were deployed inside the grain cleaning and storage portions of the facility to monitor inside populations
- Commercial phermone lures were changed weekly in all Lindgren traps and LGB adult captures were assessed daily (weekdays only) in outdoor traps and weekly in inside traps from May 15, through October 26, 2004
- Unbaited sticky cards (rodent glue boards) were affixed from ground level up to 200 cm high on walls adjacent to each overhead door inside the warehouse
- Sticky cards were observed weekly to determine capture of all stored-product insects
- Data analyses included repeated measures analyses on the effect of trap location
- Correlations between mean LGB captures outside the facility and mean captures inside the facility and total captures on unbaited sticky cards were examined

Results and Discussion

2004 LGB Captures by Day

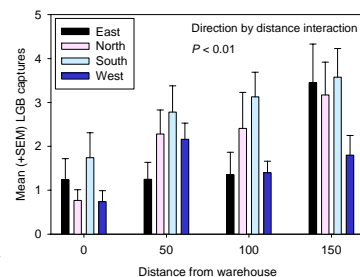


- Peaks in flight activity were observed in early May and then again from late August until cool weather inhibited flight
- We hypothesize that these peaks may be associated with dispersal from and to overwintering sites
- We are investigating weather phenomena to model variability in captures

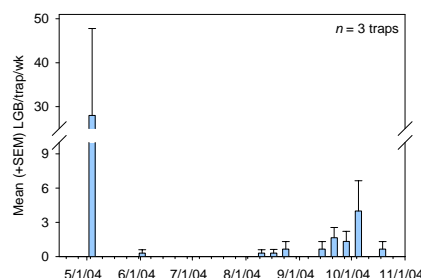
- Geographical features such as proximity to trees, bins, and standing crops may affect LGB capture in traps

- There appeared to be no directional bias in trap catch
- Traps placed 0 m from the warehouse captured fewer LGB, perhaps because insects could only enter the trap from one side as opposed to 360° around the trap if located away from the warehouse

Outside LGB Captures by Distance and Direction



Inside LGB Captures in Lindgren Traps



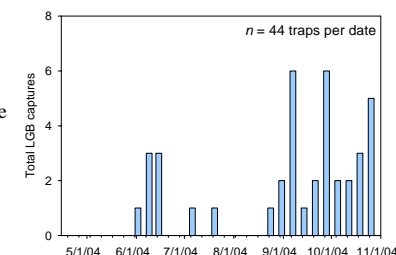
- There was a significant correlation ($r = 0.99$; $P < 0.01$; $n = 22$) between inside and outside LGB captures
- Fewer insects were captured inside the facilities
- Fumigations should be conducted after the fall flight peak to avoid risk of reinfestation

- LGB entered the facility through gaps around overhead doors

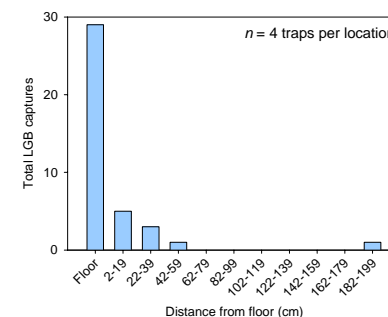
- There was a significant correlation ($r = 0.62$; $P < 0.01$; $n = 22$) between these door captures and LGB captures in outdoor traps

- Sealing around doors in late August may prevent infestation

LGB Captures on Sticky Traps



LGB Captures on Sticky Traps by Height



- Vast majority of LGB were captured on the floor or just above it
- LGB immigrate into facilities at ground level
- Condition of door sweeps and overhead door gaskets could be important for preventing insect entry

Summary

- LGB captures in outdoor phermone-baited traps showed a very large peak early in May followed by significantly low activity during the summer months, and then increased activity starting again in late August and continuing until cool weather inhibited flight
- Capture of LGB inside the facility, in both phermone-baited Lindgren traps and unbaited sticky traps, was correlated with outdoor captures suggesting that capture in outdoor traps could be used as an indicator of when warehouses are most susceptible to infestation
- LGB captures in unbaited sticky traps were primarily at ground level, indicating that targeting these areas with proper sealing (door sweeps and overhead door gaskets) or other intervention strategies (e.g., residual insecticide applications) may prevent insect immigration
- Large peaks in flight activity early in the year suggest dispersal from an overwintering site, which we believe offers an opportunity for future study as a point of managing LGB
- We hypothesize that LGB populations may be managed before they arrive at warehouses